PAVING AND MUNICIPAL ENGINEERING

A Journal Devoted Specially to Street and Sidewalk Paving, Sewerage, Water-Works Construction, Street Lighting, and all Matters Pertaining to Municipal Engineering.

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Look out for the Next Number.

Beginning with January the date of issue of PAVING AND MUNICIPAL ENGINEERING will be changed to the first of the month instead of the 15th. It will then appear in

New Form with New Features,

adopting the size and make up of the magazine, it will be largely increased in size, generally improved throughout, with a high grade of general excellence in every department.

The List of Contributors

already secured for the New Magazine contains many of the names of the most prominent authorities both in America and in Europe upon the important subjects coming within the scope of Municipal Engineering and the Improvement of Cities.

The January Number

will be one of the notable publications in technical literature. Among those who will contribute are the following:

MAJOR J. W. HOWARD, who writes on Municipal Engineering in Paris.

MR. D. V. PURINGTON gives some of the elements essential to success in the manufacture of Paving Brick.

MR. LOUIS H. GIBSON, returned from his eighteen months tour of Europe, where he made a special study of Municipal Engineering, contributes an important article.

MR. ARTHUR LAGRON writes on the Road System of France.

MR. WILLIAM STEYH furnishes an article of special importance and interest on Brick Pavements.

AND MANY OTHERS add to this list a fund of general information which makes the January number distinctively the best technical magazine issued.

THE SUBSCRIPTION PRICE of PAVING AND MUNICIPAL ENGINEERING in the new form is $2.00 a year in advance.

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A CIVIL ENGINEER'S OBSERVATIONS ON STREET PAVING AND STREET RAILWAY TRACKS IN SEVERAL CITIES.

CHARLES L. SLOCUM, city engineer, of Springfield, Mass. accompanied by W. L. Dickinson, superintendent of streets during the last summer visited several American cities for the purpose of gathering information regarding street paving. In a report of his observations he says:

"A marked improvement was noticed in the New York pavements since a visit made about a year ago. Broadway has been newly paved in connection with the introduction of the new cable system of propelling street cars. This thoroughfare is now in splendid condition and speaks well for the thoroughness of the New York people in executing street work.

"In connection with the new Broadway pavement was noticed the form of rail employed for street car use, which is of the open groove variety. The paving being laid on a level with the top of the rail no obstruction is offered to vehicles crossing the tracks, or in turning out from them. This form is doubtless far superior to the T rail so generally employed in Springfield, and its citizens who drive horses and admire smooth riding pavements would, without doubt, be well repaid with a passing observation of this improved form of rail when visiting New York city. The commissioner of public works of New York would not permit the use of the T rail in that city, it being regarded too detrimental to the interests of the public who use the streets.

"Philadelphia was next visited for a further study of pavements. A loan of $3,000,000 was found to have been made in that city aside from the annual appropriations for public works. The chief commissioner, directly in charge of street improvements, was interviewed, and a lengthy and careful inspection of street work made with him in different parts of the city.

"It was found that, as in New York city, the policy is employed of using better and more improved forms of pavements. The use of sheet asphalt is being rapidly extended in both the business and suburban parts of the city, the same methods being employed for laying this form of pavement as were noted in New York city. It was also observed that many streets of heavy traffic were being improved with this form of pavement.

"The city finds use for the material in the old cobble-stone pavements when a concrete foundation is employed for the new and improved pavements. The old cobble-stones are crushed and used in making the first concrete, thereby effecting quite a reduction in the cost of the new pavement.

"In Germantown and vicinity there have been laid many vitrified brick pavements. This form of pavement consists of a single course or layer of hard burned and thoroughly vitrified brick, laid upon their edges on a base or foundation of coarse sand or gravel well compacted. This pavement presents a good surface, the frequency of joints preventing the feet of horses from slipping. A limited quantity of asphalt blocks were also seen in one or two Germantown streets.

"It was noted in Philadelphia that the street railway company use the girder rail with tram head, which although not as convenient for the public use as the open groove section seen in New York city, is yet a great improvement on the T rail in being free from the deep rut against the rail head of the T rail. We were further told that the street railway company has adopted this rail in preference to other and lighter forms as a matter of economy in the maintenance of the track system. The tendency seems to be in nearly all places where electricity has been introduced to employ stronger and more permanent track structure in order to provide for the heavier cars used.

"The street railway company in Philadelphia is required to maintain the street surface for the whole width between curbstones wherever their tracks are laid. The company is in a flourishing condition as to finances, and does not regard this requirement as an especial hardship.

"Baltimore has many fine and well-paved streets. Granite

blocks are used for streets where the traffic is heavy and Trinidad street asphalt, asphalt blocks and vitrified brick are used where the traffic is of a lighter character. Many of the residence streets have been paved with sheet asphalt and asphalt blocks, and are mainly in good condition, the pavement being so smooth as to be almost noiseless during the passage of vehicles and offering but very little resistance to the traction of heavy loads.

"Gutters were observed here made of hydraulic cement concrete, which is very much like the granolithic sidewalks so generally used in large cities. This form of gutter is mainly used in connection with streets paved with some form of asphalt, and prevents the decay and disintegration that would result from standing or flowing water in gutters laid with asphalt. The presence of the sluggish streams of water fouled by the washings of floors, backyards and alleys coursing the street gutters of this fine city is responsible for some of the disagreeable odors as well as the unsightly appearance of many of the Baltimore streets, and it would seem that the public health could not be much benefited thereby

"Many pavements in Baltimore are made of asphalt blocks that had been laid for several years and are yet in good condition.

"Washington seems justly entitled to the finest and smoothest pavements to be found in the United States. Advantage is here taken of the smooth and noiseless qualities of the asphalt pavement on streets where the government buildings are located as well as the numerous fine residence streets. There is nothing left to be desired, apparently, in the matter of a desirable pavement upon the broad and straight Pennsylvania avenue, with its smooth and clean sheet asphalt surface and improved street-car rails, which are of the full groove pattern lying flush or smooth with the asphalt surface and presenting no obstacle to the passage of vehicles in any direction.

"A large proportion of the streets in Washington have been improved by laying asphalt pavements, and a casual observer can not avoid the conclusion that a great saving in the wear and tear of vehicles must result from the use of these smooth pavements. This matter is not always considered as much as it should be, and many of our citizens would doubtless be surprised at the great saving effected by the use of smoother forms of pavement. Asphalt blocks have been used here to a large extent, and many streets laid with these blocks are as smooth as sheet asphalt—so completely has the process of ironing out the surface joints been effected by the heat of the summer sun and traffic combined. These asphalt blocks are laid upon a well compacted foundation of gravel and sand, the coarser gravel insuring a good drainage and the long life of the asphalt block. Some streets were seen that had been paved with blocks some twelve or fourteen years ago. They are still in good surface, and are apparently capable of sustaining the traffic for a considerable time yet.

"In front of the office occupied by the engineer commissioner was noted an experiment of the comparative value and durability of asphalt blocks as compared with vitrified brick, half the width of the street being laid with one kind of material and half with the other, the traffic being about equally divided on each half of the street. The two materials having been laid but a few months, not much can be said at present as to their relative merits. This city has so fully realized the importance of avoiding the constant tearing up of fine pavements for the purpose of laying the various underground pipe systems that they were led to adopt a more thorough manner of performing this work. When new pavements are laid every effort is made to place all pipes and conduits that may be needed underground before the laying of the pavement. If from any cause after the pavement is laid, repairs are necessary to any pipe or conduit, the party or corporation making the repairs are required to obtain a permit and deposit a sum of money sufficient to cover the cost of putting back the paving materials when the repairs are finished. The city performs all labor of putting back the pavements, and the actual cost of the work is charged and taken from the sum deposited by the party or corporation for whom the repairs were made.

"The patrolmen on the police force are required to note any one they may find in the public streets about to tear up pavements for any purpose, and if the parties making repairs are not found with a proper permit they are not allowed to proceed until such permit is obtained.

"The city of Wheeling, W. Va., has quite an extended experience in the use of fire-clay vitrified paving brick. The city being located near the Ohio river valley, manufactories making fire-clay brick are able to buy this material more cheaply than cities situated farther away. The city has an experience extending over ten years in the use of this form of pavement, and many streets were observed that showed good results. Some of the streets first laid appeared to have been paved without the best of foundations, and the pavement laid the longest showed some irregularity of surface, a part of which was doubtless due to the foundation employed and the rest to a lack of uniformity in the wearing qualities of the brick. Upon the whole, Wheeling has proven the utility of this kind of paving material, and quite a valuable lesson can be obtained from its experience.

"The brick pavements are uniformly laid on a sand or gravel foundation—this being the cheapest method as to first cost. Better results would without doubt be obtained from the use of a concrete base or foundation, especially when the sub-soil is liable to be affected by frost. This, however, adds considerably to the cost of the pavement.

"One of the difficulties with fire-clay brick pavements arises from a lack of uniformity in the wearing qualities of the brick occasionally found in the material, the result being an uneven wear of the pavement. All brick pavements should be subjected to a close inspection when laid, in order to insure proper quality of material. Fire-clay paving brick are better adapted to streets of ordinary traffic than to streets of very heavy traffic. The city of Wheeling, however, has not hesitated to use vitrified brick for paving streets of heaviest traffic, but much doubt is entertained whether this material is as well adapted to streets of heavy traffic as the Belgian stone block.

"The city of Syracuse, N. Y., has during the last year or two introduced the vitrified clay brick as a paving material, and apparently with good results. One street seen, that had been paved with this material, illustrated the folly of attempting to lay permanent pavements too quickly upon ground that has been dug up and improperly replaced. Quite an irregularity of the surface to the pavement was noticed, due to the settling of the ground after the pavement was laid. The vitrified brick are laid upon a concrete base and the joints filled with a thin Portland cement.

"One street was noticed where the brick pavement laid last year was subject to very heavy traffic; the bricks showing no appreciable wear. All the bricks used in Syracuse for paving purposes are made in that city from clays found about eleven miles distant from Syracuse. The works were visited and the process for manufactures examined. The clay employed has peculiar qualities and vitrifies uniformly through the entire brick by the proper application of heat in burning. All bricks are burned and vitrified in a down draft kiln, the same as used in the vitrification of sewer or drain pipe and the other fire-clay products. This form of kiln is necessary in order to secure an even or uniform degree of heat.

"The interior of one of the kilns was examined that had been filled with bricks and the fires started some three or four days previous. It was found to be at red heat all over, the entire inside of the kiln and its contents apparently undergoing the same degree of burning. One feature of the day was noticed that is peculiar to this variety: After the proper degree of heat has been applied to insure thorough vitrification, the clay immediately assumes a different structure, containing voids, and is apparently worthless for any and all purposes. This quality is of value, for the brick is practically insured against over-burning to extreme brittleness, as is the case with other clays observed."

THE FACILITATION OF TRAFFIC.

To the Editor of Paving and Municipal Engineering:

SIR—W. L. Dickinson says in your October issue, page 128, "The essential requisites for the pavements of streets with a very heavy traffic are solidity, durability and capacity to withstand the constant strain of the heaviest and most crowded wagon traffic. It does not require much research or deliberation to determine that pavements of granite block of the proper dimensions and quality, and with proper foundations meet these requisites more fully than any other known pavement."

"Withstand" and "Resist" are the words generally used in speaking or writing of "Heavy Traffic," from the standpoint of pavement.

Now, it is wrong to think of resisting vehicle traffic, either heavy or light. Evidently "Heavy Traffic" means *destructive traffic*, and destructive traffic is simply *bad practice*. Narrow tires constitute "heavy traffic."

Instead of building pavements to "withstand the constant strain of the heaviest vehicle traffic," we should adapt the strain to the capacity of pavements best suited *for the facilitation of all traffic*.

It is evident that "crowded wagon traffic" is less crowded on asphalt or brick than on granite pavements.

Generally speaking, granite pavements cost traffic, whether light or heavy, from three times as much (at a walk) to ten times as much (at a trot) as asphalt or brick pavements cost the same traffic.

Thus granite makes traffic from three to ten times as "heavy" as it would be on asphalt or else crowds traffic as the increased heaviness shows it up.

About 44,000 square yards of granite pavement were laid in Memphis in 1891, costing $4.45 per yard, *first cost only*. Under proper tires asphalt (and brick, no doubt) could be perpetuated for about $3.50, first and final or investment cost.

I suggest that you give a prominent place to some such permanent notice as the following:

All contributors to the columns of this publication take notice that such "heavy traffic" as makes necessary (?) granite pavements, is unnecessary, being simply the silly practice of using narrow tires.

Narrow tires means inadequate tire widths. Such inadequacy is easily determined, and should be remedied immediately by the enforced requirement of less load or increased tire width. We are entirely too careful not to hurt the feelings of those who are bent upon "man's choice errand, destruction." The wearing out of a pavement costs more than the laying and maintenance of it—the making of dust costs more than the replacing of the worn-out material; and the using of a repaired road or street costs more than the repairs.

Please impress upon your readers the prime necessity for facilitating vehicle traffic in the most direct and most economical way, that is, by using only adequate tires and smooth pavements. I do not lose sight of the necessity for joints in pavements upon grades, but no grade should be tolerated where brick of the proper shape will not serve the purpose. Granite and all other stone block pavements must go if we are to have the "most economical facilitation of traffic."

J. M. HEISKELL.

Memphis, Oct. 19, 1892.

WHAT AN IOWA ENGINEER SAYS ABOUT BRICK STREET PAVEMENTS.

THE street paving question is under discussion in Knoxville, Tennessee. A citizen recently wrote to Mr. Charles P. Chase, of Clinton, Iowa, for information as to the experience with vitrified brick in the paving of that city. Mr. Chase's reply was as follows:

"I will endeavor to comply with your request and give you my views of the respective merits of brick as a pavement for the streets of cities and towns, from the standpoint of my own experience and observation and also confirmed by the reports of so many experts whereas good brick has been used. I think it will be difficult to find a single locality where a properly constructed brick pavement has been tried and has not given entire satisfaction. * *

"The pavements now in general use are wood, granite, asphalt, and brick (the latter of more recent innovation). The only merit of wood is its economy in its first cost and freedom from noise. Its average durability is but six or seven years. For the first three years it remains smooth under moderate traffic, but afterwards it becomes rough and necessitates frequent repairing. The absorbent property of wood, after the top asphalting has worn off, makes its use very objectionable in a sanitary point of view. The filth of the street soon saturates the blocks, and in warm weather the exudation arising therefrom is offensive and unwholesome. Asphalt makes an expensive pavement compared with wood or brick, has been found to be costly in annual repairs (as by the action of water, mud and frost, it rapidly deteriorates), and on a moderately steep grade is slippery and affords a poor foothold for horses. Granite is a durable, but expensive and noisy pavement and more slippery for horses than either wood or brick. If granite setts could be obtained of the same size as brick, horses would soon round off the edges so as to get a firm foothold, but the reduction in size would greatly increase the cost.

"The value of brick as a pavement has passed the experimental stage, it having been tried and adopted in more than two hundred towns and met with universal favor, so much so, indeed, that it has generally excluded all other styles of pavmements. The objections heretofore stated in regard to the other pavements are in a much less degree applicable to brick. It may not be amiss to predict that within five years many of the costly granite pavements in our large cities will be taken up on account of their unavoidable noise and slipperyness, and replaced with brick. In many places brick have been made which have withstood greater crushing resistance than granite. In front of the freight depot of the C. B. & Q. railway in Chicago, on account of the difficulty of the horses to get a foothold to back their heavy loads to the platform, the granite pavement was taken up and asphalt substituted therefor. This was soon scooped out into basins by the turning of the wheels with their heavy loads, and the company consequently took it up and replaced it with vitrified brick. This, for over two years, has stood the stress and traffic of over four hundred tons per hour, during ten or twelve hours per day. It is now but little the worse for wear, and has answered all the requirements desired.

"As to the number of years a brick pavement may be expected to last, I can only say that all well-made brick pavements in this country are still in use. Bloomington, Ill., has a pavement that has been in use 18 years, Charleston, W. Va., one that has been in use 16 years, both are reported to be in good condition, having had but a moderate amount of repairing. The brick used in these pavements referred to are, furthermore, inferior in point of quality to those that are now manufactured. One of our pavements here [Clinton, Iowa] has been in use about 4 years, and the centers of the brick are not worn off one-eight of an inch. You can readily estimate how long they will last before being worn off one inch.

"Doubtless suitable clay or aluminous shale for vitrified or hard burned brick exists in your locality, and could be utilized for the manufacture of all the paving brick that would be used in your city. If a clay or slate, believed to be suitable for making vitrified brick, upon a chemical analysis, is found to be composed of about 65 per cent. of silica and 14 to 20 per cent. of alumina, from 4 to 7 per cent. of iron, with from 2 to 4 per cent. of magnesia, one or two of potash and some traces of lime, it can be relied on to make a first-class paving brick under proper treatment with an experienced brick manufacturer.

"The foundation upon which rests the paving material should be of such material and so constructed as to be firm and unyielding, and such that when necessity requires the service pipes beneath the street for water and gas may be reached for repairs, etc., and the foundation replaced in as good condition as before being disturbed, by an ordinary intelligent workman. This could not be well done when the foundation is made of concrete, which is often

done in many cities for a brick pavement, or with a double course of brick, which seems to be the general plan in most places.

"Such foundations are more expensive and a greater obstacle to underground repairs.

"It was for economy of first cost, as well as to afford the easiest facilities to reach underground service pipes, and restore the foundation otherwise to its normal condition, that induced here the adoption of finely broken stone with the spaces filled with sand as a foundation on which to rest a single course of brick. This method has proved satisfactory in every respect. Delegates from neighboring cities where a double course of brick has been adopted in their pavements, recently visited this place to examine the working of the single course of brick here upon the sand and stone foundation, and reported in favor of adopting hereafter the style of pavement in use here.

"A durable paving brick may be either hard burned, that is, burned just short of the point of fusion or vitrification, or completely fused and both well annealed. The former is perhaps the tougher, the latter the harder; the former will absorb more or less water, the latter only in a small degree. Either is a first-class paver. There is a general impression among brick experts which seems to have come from a sort of tradition, that because an ordinary building brick saturated with water will disintegrate from the action of frost, that a hard burned paving brick that will absorb more than two per cent. of water is unfit for a pavement. My experiments have led me to a different conclusion. I have kept in boiling water for two hours hard burned paving brick absorbing five per cent. of cold water, and exposed them during the night to a temperature of ten degrees below zero, and continued the experiment for several nights, which is a more crucial test than any exposure in a pavement. The brick were uninjured by any action of the frost. If a hard burned brick is sufficiently strong to withstand the action of frost, its absorption is unobjectionable only as an absorbent of the refuse of the street.

"Our curbstones here are the Ohio Berea sandstone, and will absorb from five to eight per cent. of water and still not one has failed from the action of frost. This shows that the absorption of water in the stone is not always injurious by the action of frost and doubtless is not upon hard burned brick generally. The absorption by brick of water by rain and street sprinkling, doubtless has a beneficial effect upon its wear, by the friction of wheels, as water does on the action of a grind-stone. The custom is to lay the top course of brick at right angles with the course of the street. The intersections of our streets where the brick are laid at an angle of forty-five degrees with the course of the streets, is wearing better than where the brick are laid at right angles with the street. I am of the opinion, from my observation here, that all brick should be laid at an angle of forty-five degrees with the street. Experienced paving contractors are always willing to give a six-years' guarantee with their brick pavement without extra cost to the city.

"You can warrant for brick pavement the following merits and advantages over the other pavements; 1. Economy of construction; 2. Smoothness of appearance; 3. Comparative freedom from noise; 4, It furnishes the best foot-hold for horses; 5. Its durability is equal to granite; 6. Economy of convenience of repairs; 7. Facility for reaching underground service pipes.

"It was lately remarked by one of our citizens, who, at the adoption of pavement for our streets here strenuously advocated cedar-block, and with most of our citizens here, persistenly opposed brick, that 'had the then public sentiment of the place been heeded, and cedar-block adopted as the pavement with the evidence presented before them, and the progress and experience of the country in the more perfect brick pavement, the fool-killer would have been warranted in putting in an appearance and depopulating the place.' If this be true in some other towns larger than this, that have not had the hair-breadth escape we had here, His Royal Highness, the F. K., has yet a sad duty in store to perform for them."

THE INDIANA ROAD CONGRESS.

THE Indiana Road Congress, held under the auspices of the Commercial Club of Indianapolis, in the hall of representatives, Indianapolis, state house, December 6-8, was attended by nearly five hundred delegates, appointed by county commissioners, city and town councils, county agricultural societies, farmers' institutes, commercial organizations and wheelmen's clubs. Many township trustees were also in attendance. The congress was called to order by William Fortune, chairman of the Commercial Club committee in charge of the arrangements. He introduced Governor Chase, who delivered a short address on the importance of the assemblage, and his hopes for beneficial results from its deliberations. Col. Eli Lilly, president of the Commercial Club, talked briefly, making some well-considered suggestions. An organization was then effected by the election of Hon. Claude Matthews, governor-elect, as chairman, and Mr. Evans Woollen was chosen secretary. Papers from Gen. Roy Stone, of New York, and Col. Albert A. Pope, of Boston, were read. Addresses were delivered on Tuesday afternoon and Wednesday, as follows:

G. W. Dorrell, "The Roads of Southern Indiana."

E. L. Furness, "Construction, Cost and Benefits of Improved Highways in Northwestern Indiana."

J. T. Campbell, "The Gravel Roads of Parke County."

W. P. Carmichael, Secretary of the Indiana Society of Civil Engineers, "Some Criticisms of the Present System of Road-Making in Indiana."

Professor W. B. Johnson, "A Plea for Better Engineering on Our Country Roads."

B. L. Blair, "Road-Making Material in Indiana and its Distribution."

J. P. Applegate, "Roads Without Metal; The Best Way of Making and Keeping Them in Repair."

Honorable J. A. Mount, "Good Roads from an Economic and Social Point of View."

D. L. Thomas, "Farmers' Need of and Ability to Construct Good Highways."

Louis H. Gibson, "The Roads of Europe."

Professor W. C. Latta, Superintendent of Indiana Farmers' Institute, "The Money Value of Good Roads."

Each paper was discussed for half an hour.

The question of needed legislation was discussed on the last day of the session, with the following introduction of the subject by the chairman of the committee in charge of arrangements for the congress:

"There is a Russian proverb about 'going through the forest and seeing no firewood.' It may be well applied to economic conditions in America, with especial reference to the efforts of our people to promote common welfare and their neglect of a primary means to that end of such paramount importance as the common road, which bears a relation to civilization and prosperity not sufficiently understood or appreciated by the public in general. Throughout the world's history its condition has been an indication of progress or retrogression. Aside from its easily traceable influences on the social life and consequent intellectual improvement of people who have the benefit of its advantages, it is in a large way an economic factor, affecting all who have to do with the development of general prosperity. And yet, in the political government of our own times, it has been neglected to an extent that must be a reproach on our civilization, if not a discredit to our intelligence.

"Within a few years, however, much has been done to stimulate public appreciation of the importance of good roads, and it may reasonably be expected that the demand for better legislation relating to their construction will at no far distant day become a vital political issue. When the people have considered the subject carefully enough to ascertain how greatly they are concerned, political parties will not be permitted to ignore the question.

"In Indiana we are annually expending upon country highways largely more than the total yearly appropriations forthe executive,

administrative and judicial departments of the state government, including the maintenance of the various public institutions, but this great expenditure is so wastefully applied that we derive from it nothing but a small temporary benefit. Under better methods we should and would realize the full value of every dollar of our road taxes, which now may be considered as so much money almost wholly wasted.

"Some calculations as to what our roads are costing us in taxes collected from our people may be based on the levies provided for in the present laws. Township trustees are permitted to levy 30 cents on each $100 of assessed valuation, payable in labor at the rate of $1.25 a day. Estimating the average taxable valuation in each of the 1,013 townships in the state at $700,000, this levy would yield a total of $2,127,300 annually. In addition to this, the trustees may also make a cash levy of 10 cents on the $100, which may be used for the construction of both roads and bridges, and, while available for both purposes, really goes largely into roads. On this levy $707,076 may be raised. Road supervisors may also make a labor levy of from two to four days. The average is about three days, and the average number of men who may be called out in each township is about 150. At the rate of $1.25 a day for each man this labor would represent a cost in the entire state for three days of $228,075. The total of these three levies is $3,064,471, which would pay for 766 miles of well constructed macadam roads at $4,000 per mile, each year, or 1,532 miles of good gravel roads at $2,000 per mile. If applied to construction of permanent roads, we would have in Indiana at the end of ten years 7,660 miles of macadam roads, or 15,320 miles of good gravel roads. This, in ten years, would give to each township an average of seven miles of macadam, or fifteen miles of gravel roads. If the possible benefits of the present laws were fully realized, we would have at this time more than double this number of either kind of roads, but instead, in a majority of our townships there is not a mile of permanent roadway, and all of the money and labor yearly expended has gone regularly into the same old chuckholes.

"Where we have nothing to show for this expenditure when we might have, it can only be considered as a waste, and the aggregate of this waste during the last quarter of a century, is fully $50,000,000, enough to have given us a complete system of highways, easily traversible at all times of the year. In addition to this wasted expenditure, there has been a loss resulting from inability to get products into the market at times when the roads are bad, and from the consequent interruption of commerce, amounting to many times more than this sum. This seems less serious than absolute impoverishment only to those who do not appreciate the fact that failure to acquire wealth when it is within reach is equivalent to the loss of it.

"Reference to some of the faults of the present road laws of Indiana will sufficiently explain the causes of the waste from which we have so long suffered:

"1. The township trustee who determines, within the limitations of the law, what the levy shall be, has no control over the work or the expenditures on the roads; this is in the hands of the road supervisors, who are elected by the voters in the different road districts. As the voters desire to avoid road work as much as possible, they usually elect some person who is known to be in sympathy with their antipathy to such work, and who will not rigidly compel compliance with the legal requirements for the performance of such labor.

"In consequence of the inefficiency of the supervisors, and, with his permission, the shirking of duty on the part of his constituency, the labor levies by both the trustee and the supervisor yield an average of not more than one-half the amount represented by road taxes.

"2. The trustees do not on an average levy more than one-half the labor they are permitted by law to call for. Many of them say that they find it useless to levy more because, whatever the levy may be, they can not, under the present system, get its equivalent value in labor, and they have no authority over supervisors enabling them to compel full compliance with the levy.

"3. The supervisor realizes in the same ratio less than the full value of the levy which he is authorized to make, which is usually not more than three-fourths of the limit fixed by law.

"4. The supervisors are usually men who have no knowledge of the simplest principles of engineering and have had no opportunity for learning the science of road-making. They are, therefore, not qualified to properly direct the work on the roads, and both the labor and money expended under their supervision produces nothing of permanent value.

"5. There is no intelligent attempt to do work of any other than a merely temporary character.

"These are not all but some of the principal faults of the present laws. An analysis of them will show that there is a direct loss of a million dollars a year chargeable to them, in that there is no service rendered for taxes of that amount, while the remainder is wastefully expended and only temporary benefits are realized from it.

"It is commonly supposed that a new demand for public improvements of any character necessarily implies an increase of taxation. This is often true, but I believe that the provisions of the present laws in Indiana relating to tax levies for road-making are ample. The legislation that is most urgently needed is not an increase of the present limitations of taxation, but such as will require honest payment of the levies now authorized to be made and insure intelligent expenditures of the proceeds of these levies. The state will be made from $2,000,000 to $3,000,000 richer every year if it can only secure the honest worth of the money and the labor that is now frittered away. A better system of work will in the course of time accomplish all that is desired; if we continue in the present way there is no assurances that there will ever be any marked improvement in our roads.

"We can only secure a better system by placing the road work under intelligent direction, and by giving adequate power to the officials charged with responsibility for it. I believe that we should have a State Highway Commission who should have control of the construction and repair of our roads, with authority to direct the work in a systematic way. They should have broad powers, enabling them to determine when, where and how roads shall be improved, and to compel compliance with all laws relating to their protection. As we have much to learn about road-making, the commission should be authorized to report to the governor or the legislature such changes in the road laws as their investigations might lead them to believe advisable.

"I believe that such a commission as is suggested should have authority over the township trustees on all matters relating to roads and that the township trustees should in turn appoint and direct the road supervisors, instead of permitting them to be elected by popular vote, the influences proceeding from which constitute one of the principal abuses under the present laws.

"In addition to such instructions as should be given to trustees and supervisors by the State Commission, it seems practicable to require the supervisors to qualify themselves for their duties by acquiring a knowledge of the simple principles of road-making. This instruction could be given through the medium of road supervisors' institutes, similar to the teachers' and farmers' institutes, to be held for a week or ten days each year in different sections of the state, and to be conducted by persons detailed for this duty by the State Commission. It would, of course, be necessary to give supervisors some compensation for the time devoted to this study, but it would be to the state a profitable expenditure of money. Good roads can not be made without a knowledge of how to make them, and it is important that this should be possessed by the officers in direct charge of the work. The roads of Europe are better than those of America, chiefly because the work upon them is under the direction of men who know how it should be done, coupled with the fact that repairs are made promptly when needed.

"Some such system as this would introduce executive respon-

sibility and intelligent direction in the expenditure of from $2,000,000 to $3,000,000 a year from which little is now derived because it is not under proper control and is not intelligently directed.

"An appropriation of one per cent. of the amount now annually wasted would be sufficient, it is believed, for all expenses of the proposed state commission.

"In suggesting in this general way the idea at which I believe we should aim, in asking legislation for the betterment of our highways, I have avoided entering into a discussion of the many details involved in the plan, because all belong to the more exact work of the preparation of a bill for the consideration of the legisture. I submit to you this brief outline of what I believe to be desirable for whatever it may seem to you to be worth, and as an introduction to the discussion now to follow on needed legislation."

The report of the committee on legislation was presented. It recommended that the present road laws in Indiana be repealed and that the roads be placed under the control of county and township superintendents, to be appointed by the circuit courts; that each county be required to build not less than five miles of permanent roads each year; that counties be authorized to issue bonds for the purpose of raising money for road construction, and that twenty per cent. of the public improvement funds of all cities and towns be applied to the construction of country roads. The report was adopted after several hours of discussion, and after it had been recommitted to the committee for revision.

A permanent organization was effected by the election of Mason J. Niblack, of Vincennes, as president; Evans Woollen, Indianapolis, secretary, and Louis H. Gibson, Indianapolis, treasurer, with vice-presidents from each congressional district, all of whom will constitute the executive committee of the association. The agitation for better roads will be kept up, and an effort will be made to secure the enactment of better laws by the next General Assembly The convention was altogether probably the most successful of the kind ever held in the United States.

THE GREAT MOVEMENT FOR BETTER ROADS.*

By Col. A. A. Pope.

IT may be maintained that the beginning of this movement was in April last when the attention of the authorities of the World's Columbian Exposition was called to the fact that by the classification adopted by them the exhibit relating to road construction and maintenance would be scattered in five enormous buildings, having an area of upwards of eighty acres. In order that sufficient influence might be brought upon the commission to cause them to change their plans, and erect a suitable building in which should be gathered all the road exhibits, thousands of copies of an open letter setting forth the facts of the case were sent to the editors of newspapers throughout the country with the request that they publish comments on the letter. The result was that hundreds of newspapers printed able editorials on the subject of the improvement of highways and the necessity of a comprehensive road exhibit at the exposition. A large number of letters from prominent men were received commendatory of the movement for better roads.

President Harrison wrote, "A want of understanding and system has resulted in a nearly useless expenditure of enough labor and money to have furnished the settled portions of our country with good, substantial roads."

Hon. John Wanamaker, the postmaster-general, says, "Looking at it from a postal standpoint, enlarged free delivery, or anything like universal free delivery, will have to be postponed until there are better facilities of communication through the rural and sparsely settled districts. The experiments that we have made in the smaller towns and villages have proven the practicability of greatly extended free delivery, but without good roads, it must necessarily be limited to the small towns."

*Read before the Indiana Road Congress at Indianapolis, on December 6, 1892.

Hon. D. H. Patton, of Indiana, whom probably many of you know, wrote, "Yours of the 30th ult. is received, and in reply to your inquiry as to my opinion for the necessity of appropriate arrangements being made by the management of the World's Columbian Exposition for a comprehensive display of methods, material, and machinery for making good roads, etc., I would say there is, in my judgment, nothing that would be productive of more real benefit to the people of the great grain-producing Northwest than such a display. It is just now the great problem that they are trying to solve, namely, how to make good roads."

These, with many other letters and editorial articles, were printed in a Memorial and submitted to Congress last July.

Thousands of these memorials were scattered all over the country, with the result of arousing popular interest in this important subject.

Letters were sent early this autumn to presidents of all the principal railroads in the United States, urging them to establish road departments for the purpose of assisting in the promotion of knowledge regarding the construction of common country roads, as feeders to their railroads. The plan suggested seemed to meet with much favor among railroad officials, and as one immediate practical result, Mr. Flagler, whom you all know on account of his connection with the Standard Oil Company, and president of the Jacksonville, St. Augustine and Halifax River Railroad Company, wrote as follows to Gen. Charles H. Howard: "I have read with interest the articles in the *Farm, Field and Stockman* in relation to good roads, also Col. Pope's communication, and I now have to say, that so far as the making of a road from your settlement to the line of our road at Oakside is concerned, if your people will load and unload the cars, we will haul all the material necessary to make the road, free."

Letters were also sent to the Presidents of Universities and Colleges urging the establishment of professorships or instructorships in road-making in their institutions; or if they were unable or unwilling to do this, at least to advise their lecturers in political economy to introduce the subject into their discourses. These letters met with approbation, and several colleges have begun such a course of instruction, notably, Harvard University, which began teaching highway construction this autumn and will give graduates in this branch the degree of Road Engineer.

In Chicago, last October, a National League for good roads was formed. I am of the opinion, however, that the most important movement concerning highway improvement now before the country is the effort now being made to establish in the city of Washington, in the District of Columbia, a road department, similar to the agricultural department.

A few newspapers have raised objections to there being such a department, and have expressed an opinion that it should be simply a bureau in the Agricultural Department, but to most persons the wisdom of its being a department by itself, or perhaps in a department which shall embrace all forms of transportation, a Transportation Department, is clearly apparent.

The petitions which are now being circulated all over the country urging the establishment of a Road Department, are being generally signed by leading men of all parties, and the deepest interest is expressed in the success of the movement. The petition was indorsed by the Southern Inter-State Road Congress, held at Memphis, Tennessee, November 17th. I hope the Indiana Road Congress will officially indorse it, and all its members individually sign it.

Among those who have signed it may be mentioned Governor Russell, of Massachusetts, and Governor Toole, of Montana. The Maine Central R. R. Company printed and circulated copies of the petition among their employes. President M. H. Smith, of the Louisville & Nashville R. R. Company, wrote, "If you will send me one thousand of the blank petitions, I will have them placed in the office of every agent with instructions to the agents to endeavor to secure signatures thereto." The Massachusetts Society for the Prevention of Cruelty to Animals, and the Georgia Humane So-

ciety have given their unqualified approval, and a number of boards of trade have officially recommended it. It meets with favor among college presidents, and agricultural and trade journals and the country papers are almost unanimously in favor of the objects asked for in the petition.

Such is the response to this great movement to promote the construction and maintenance of good roads throughout the country. Reform in any direction is met with opposition and perhaps it is best that such should be the case as it tends to a fuller discussion and understanding of the objects sought for; but the friends everywhere of good roads should unite in bringing the subject prominently before Congress and in obtaining signatures for the petition. The great opportunity to make better roads a matter of national importance and widest interest should not be neglected.

PAVING INFORMATION FROM THE NATIONAL CAPITAL

IN the annual report which the commissioners of the District of Columbia have just made to the President occur many matters of interest to paving engineers. These facts are herewith briefly presented.

During the past fiscal year the area of paved streets and roads has been extended, and other streets and roads have been improved by grading and macadamizing. The substitution of the Telford macadam for the ordinary macadam has been continued, and, it is believed, with benefit to the streets.

A test pavement has been laid with vitrified brick, costing about $1.75 per square yard. The commissioners state that it was laid by the force of the District, and bids fair to be successful. The other pavements laid in the District have been of sheet asphalt, asphalt block and granite block. The granite curbs, 6 by 20 inches and 8 by 8 inches, have been continued during the year. The nature, distribution and cost of the various street improvements made during the past year and the schedule of streets to be improved during the current year are given in detail in the assistant's report. In making up the schedule of new streets to be improved examination and due weight has been given, not only to the reports of the various citizens' associations, but also to the suggestions of citizens who have seen fit to make them to the District. These have been valuable to the commissioners, and the new schedule of streets has been made up with great care and is believed will forward the general prosperity of the city.

In regard to the permit work, the commissioners say the money appropriated for the purpose has been applied by the commissioners to the laying of sewers, paving of alleys and the repair and improvement of sidewalks and curb throughout the District. The commissioners have continued to lay, when requested, a more modern and improved sidewalk, and have made contracts for this purpose with the contractors. The prices of these contracts vary, and the citizen who desires to have work done is required to pay the entire cost of the pavement he desires, less one-half the cost of the cheap est of that kind of improved pavement.

In paving alleys vitrified brick have been used almost exclusively, as has been done for the past three years. This pavement continues to give satisfaction to the people interested.

Under the law the commissioners have the right to lay sidewalks, put in sewers and pave alleys without the consent of the property-owners and tax them with one-half the cost, provided these works are necessarily for the public health, safety or comfort. The bulk of the expenditures for paving alleys has been made in this way, always on a statement from the health officer that such pavement is necessary for the public health.

The commissioners recommend many improvements of and extensions to the sewerage system of the city. A board of experts has reported upon the methods of disposing of the city sewage by means of the most approved process. The cost of this service as estimated will be $4,000,000, and the time necessary to complete the work will be several years.

From the treasury department your correspondent has obtained the following information, relative to the imports and exports of asphaltum, during the month of September, which is the latest period for which these statistics have been prepared. There was imported into the United States, during that month, 4,144 tons, valued at $8,990, against 7,147 tons imported during the same month of 1891, and representing a valuation of $22,531. These imports, for the nine months ending with September, amounted to 75,829 tons, or $281,520 worth, against 67,636 tons imported during the corresponding period of the previous year, and being valued at $228,600. The exports of asphaltum for the nine months ending with September amounted to only 84 tons, or $2,513 worth, which is considerably less than during the same period last year, when 338 tons were exported, at a valuation of $4,530.

Washington, D. C., Dec. 6. CHAS. A. OLDHAM.

DISPUTED POINTS IN ROAD CONSTRUCTION.

MR. JAMES OWEN recently read a paper before the American Society of Civil Engineers on "Disputed Points in Road Construction, in which he said: "The engineer's first problem is to convince his clients of the value of his services, it being generally considered that the only use for an engineer is to give the grades. The expenditures are governed by the requirements of the community, with the willingness or unwillingness to furnish the money. Local and climatic influences are very important, and must be given due consideration. Gravel is a very common material, and fine gravel will make a good road for light traffic, but not for heavy roads. The minimum grade should be 0.5 per cent. to insure drainage, and the maximum grade in mountainous country, 10 per cent., and grades should be kept as far as possible down to 1 per cent. Underdraining should be carefully attended to, as one dollar spent in this way is better than many dollars spent in repairing badly drained roads. Roads which are 'good enough' require good enough repairs, and generally do not get them. Most kinds of hard, square stone will serve for telford foundations. The wearing surface may be of trap, syenite, granite, gneiss or limestone. Trap is best, and granite next. The favor shown limestone is largely due to the superiority of a limestone road to the original mud road, rather than to its comparison with other stone. The thickness of the road should be 10 inches up to grades of 1 per cent., 8 inches up to 5 per cent., and 6 inches on grades over 5 per cent. The general size of stone is $1\frac{1}{4}$ to $1\frac{3}{4}$ inches, and the success of the New Jersey roads is due largely to the uniormity in size of the material. As a general thing, the broken stone from the quarries is anywhere from $\frac{3}{4}$-inch to 3 inches in size, and is dumped on the road. He preferred 4 inches of $1\frac{1}{2}$-inch stone to 2 inches of $1\frac{1}{2}$-inch, and 2 inches of larger size.

"For telford paving the subgrade should not be rolled, but left so that the foundation stones can be pressed into it to bring the top surface of foundation level. These stones should be well wedged, and clay packing should then be spread to keep the spalls from working up, but too much packing will ruin a road. The packing is then rolled, broken stone laid and rolled, another layer of packing, and then the top course of stones and screenings laid and thoroughly rolled. He preferred more frequent rolling with horse rollers to less rolling with heavy steam rollers, an objection to the latter being their great weight per square foot. The rolling is not to complete the road, but to put it into condition to invite traffic upon it to complete the consolidation of the material. Renewals should not be made in patches, but the road, if properly built, should wear out uniformly and be repaired in large sections. A fair average for repairs should be three inches of broken stone every three years."

Mr. E. P. North referred to the bad practice of blindly following foreign precedent, as instanced by the roads in Central Park, New York, where the trap roads are free from shade and have to be kept watered. The constant patching of roads is not necessary with trap rock, but may be necessary with a softer stone, as in North Italy and Switzerland, where roads made with a soft limestone are kept in excellent condition by constant maintenance and repairs, but would be completely ruined if only repaired every

year or two. He preferred a 10 or 15-ton steam roller to a 2-ton horse roller. Loam packing is suitable under the latter, but for steam rolling on a trap road, trap screenings should be used, as making a more homogeneous railroad. As to the question of making thick or thin roads, by the time a 4-inch road requires rebuilding, the heavier road will require resurfacing which will cost about the same. Roads costing $9,000 to $15,000 per mile are not suitable for poor communities.

Mr. Owen said that complaints of taxes were not based on the actual amount, but on the fact that the people were paying more than other people. He had tried rock salt in the water cart, and found one watering per day to be sufficient, but it was too expensive to be carried out. Mr. Collingwood said that road laws, as those of New Jersey, should require the work to be done under a competent engineer, as otherwise the laws will be of little real value. Mr. Brush referred to the great extent to which the road question had been brought to public notice by the bicycling interests.

BURNT CLAY FOR ROADS.

THE DAVENPORT *Democrat*, published in a city where brick paving has been introduced extensively, advocates burnt clay for street improvement. It says: "Gumbo, or burnt clay, such as railroads are using for ballast, is the material suggested, and competent engineers and roadmakers believe that it will make a road equal, if not superior, to macadam or gravel at much less expense.

"This burnt clay ballast is peculiar in its properties. There is no other material like it, and its distinguishing characteristics are such as to make its friends believe it is the very thing for a road.

"It is made by heaping up long rows of clay with soft coal, much like the coke ovens with which travelers through Pennsylvania are familiar. Any kind of clay that is free from sand will do. The rows are fired and tended so that they burn in the proper manner and the result, when the fires go out, is a lot of burnt clay. It is red in color, about like ordinary brick. It is porous and highly absorbent. It is as hard as anything that is of the earth earthy. It is easily settled into a firm mass without being packed as stone and other materials are. It will not support vegetation or allow water to stand upon it. It does not wear out or deteriorate. It can be worked in midwinter, no matter how hard other materials are compacted by the frost, as well as at this season of the year. It is springy, to a certain extent, and resists crush to a remarkable degree. Twelve inches of this material placed on top of a well drained dirt foundation, an engineer says, will make an excellent road, which will settle evenly under traffic. If it does not, holes can be readily filled from a stock of the clay as fast as they appear and the surface easily preserved. The clay shows far less tendency to cut into ruts than gravel or macadam. It is springy enough to go down in a larger area if it is going down at all, and to resume its place after the load has passed. No water, with a little attention to drainage, will ever be found on it.

"The cost of constructing a road out of this material, it is estimated, would not exceed $1,200 per mile and might possibly fall even below that figure. The gumbo can be manufactured in almost any locality, so that the cost of transportation would be very small."

SEVENTH ANNUAL MEETING OF THE NATIONAL BRICK MANUFACTURERS' ASSOCIATION.

AS announced in the official report of our last convention, it has been determined to accept the cordial invitation extended by the Louisville brick manufacturers, and hold the seventh yearly meeting at Louisville, Ky., beginning Tuesday, Jan. 24, 1893, and continuing the balance of the week.

Reduced railroad rates have been applied for and in due time the necessary instructions for obtaining same will be announced, together with the arrangements for hotel accommodations, etc. The Louisville brethren are all actively interested and are going to do everything in their power to make the convention one of the most successful yet held. The central location of Louisville and the fact that this is the second convention held south of the Ohio, leads us to hope for a much larger attendance of Southern craftsmen than we have had since our memorable meeting in Memphis in 1888.

Indeed there is every reason to believe that the attendance from all sections will be unusually large, for with very few exceptions, the craftsmen throughout the land have had a prosperous season, and the prospects are favorable for a continuance of this happy condition, which, as nothing else can, will stimulate a universal desire for better knowledge of better methods by which better products may be produced in greater quantities at less expense. In brief, this is the object for which our association was formed—the advancement of the material interests of the craft generally. This may best be accomplished by an exchange of experiences and opinions; and to this end every progressive brick manufacturer of America is earnestly invited to attend the coming convention and take active part in the discussion of all practical questions that may be considered. An interesting and instructive programme is now being prepared and will be published with other particulars in the next issue of this journal.

Craftsmen desiring a copy of the constitution and by-laws of the association or the official report of the last annual meeting, can obtain the same by addressing the corresponding secretary, T. A. Randall, Indianapolis, Ind. The requisite of membership is an interest in the manufacture and use of brick and the payment of an annual fee of $2. Craftsmen who are unable to attend the coming convention, but wish to identify themselves with the National Association and to secure a copy of the official report of the Louisville convention, are requested to send their name and address to the secretary for enrollment. Respectfully,

THE EXECUTIVE COMMITTEE,

CHAS. B. PEARSON, *President.* THEO. A. RANDALL, *Cor. Sec'y.*

ROADS IN FRANCE.

PROF. F. H. NEFF, in a recent paper before the Civil Engineer's Club, of Cleveland, O., gave some interesting particulars of the management of roads in France. Roads are divided into three main classes, national, department and county. The national highways are mostly for military purposes, and comprise about 24,000 miles whose construction and maintenance are borne entirely by the general government. Department roads also comprise about 24,000 miles, and are laid out to serve the department as a whole, connecting the principal cities, and are paid for by the department. The county or vicinage roads have become the most important; their aggregate length is over 300,000 miles exclusive of roads within village limits. These roads are built and maintained by the communes or townships, whose average size is about six square miles. There is a system of engineers in charge of all these roads, with assistants who look after twenty-five or fifty miles each. Laborers or section hands are employed in numbers averaging from 1¼ to 2½ miles of road per man. The macadam road without a foundation is the form followed. The cost of construction and maintenance has averaged as follows:

	First Cost per Mile.	Annual Maintenance per Mile.
National roads	$10,000	$230
Department roads	6,500	160
County roads	2,700	80

The question of policy in laying out the new highways and distribution of cost and maintenance among the different classes of tax-payers, is one now pressing for solution in this country.

GRADE CROSSINGS TO BE ABOLISHED IN BOSTON.

THE city of Boston has filed petition in the Suffolk County Superior Court asking that grade crossings on twenty of the most important thoroughfares in that city, still unprovided with bridges, be done away with. The defendants named in the peti-

tions are the Boston & Albany, Old Colony, New York & New England, Boston & Lowell, Eastern, Fitchburg and Boston & Maine railroads. The streets affected are Clyde, Marginal, Webster, Sumner, Maverick, Prescott, Bennington, Saratoga, Curtis and Decatur, all in East Boston; Rutherford avenue, Main and Chelsea streets in Charleston; Dudley street in Dorchester; Congress, A, West First, Dorchester avenue and Northern avenue in South Boston. Under the law the state pays twenty-five per cent. of the cost and the railroad companies and the city the balance, to be apportioned by a special commission. In most cases under this law the railroad companies have paid 65 per cent. and the town or city 10 per cent.; but these cases have been mostly in country districts where the land damages were comparatively light.

PAVING WITH RUBBER BLOCKS.

SOME new ideas have lately attracted attention in the matter of pavements. Among these is the paving of a bridge by a German engineer with india rubber, the result having been so satisfactory as to induce its application on a much larger scale, a point in its favor being that it is more durable than asphalt and not slippery.

In London a section of roadway under the gate leading to the departure platform of the St. Pancras terminus has for some time past been paved with this material, with the effect of deadening the sound made when being passed over on wheels, besides the comfortable elasticity afforded to foot passengers.—*New York Sun.*

BUDAPEST'S NEW SEWERAGE SYSTEM.

THE new sewerage system for the city of Budapest, Hungary, has been completed. This improvement has been demanded for some years, as the old system had become inadequate to provide for the large increase in population of the last ten years. The new system has a capacity of three gallons of rainwater per hectar (2.47 acres) per second, and 4.17 gallons of sewage per capita per day. The population assumed is 500 per 2.47 acres. As the level of the city is but little above that of the Danube river, the sewage has to be pumped into the river. For this purpose twelve centrifugal pumps, with 3½-foot suction pipes, are used.

APPROPRIATION FOR STREET CLEANING IN NEW YORK.

THE street cleaning department of New York has had appropriated to it, for 1893, the sum of $2,190,089. This includes a five per cent. increase in sweepers, drivers and hostlers. This total is an increase of $97,000 over 1892, and is divided as follows: Administration, $167,000; sweeping, $813,323; carting, $669,766; removing snow and ice, $40,000; final disposition, $290,000; new stock, $160,000; rentals and contingencies, $50,000.

PLANS FOR IMPROVED HIGHWAYS IN MASSACHUSETTS.

THE temporary Massachusetts State Highway Commission is making a final report to the legislature. It is expected that this report will recommend a permanent state commission. Two plans are under consideration for carrying out a system of improved roads. One is the issue of a state loan for $5,000,000 for the construction of about 12,000 miles of new road in the most traveled parts of the state. The other plan is to add to the state tax an amount equal to four per cent. interest on $5,000,000, and to use this interest for the more gradual improvement of roads. An interesting feature of the report will be statistics of load-weights, width of tires and amount of travel over five roads near Boston for three days. A bill is now being drafted to squarely present the road issue, and this will be submitted with the report.

PAVING INDUSTRIES IN LOS ANGELES, CAL.

THE eleventh census is rapidly drawing to a close. For some time past a part of the bureau has been devoted to the compilation of facts pertaining to the city of Los Angeles, Cal., and its manufacturing interests. Notable among these is paving and paving material industry, which has developed into important proportions within the past ten years.

From official figures your correspondent has gleaned the following facts regarding this industry, which will doubtless prove of interest to the readers of PAVING AND MUNICIPAL ENGINEERING.

There are eleven establishments in Los Angeles identified with this important industry. These employ an aggregate capital of $176,390, classified as follows: Hired property, $6,000; value of plants, $35,890, being $1,500 worth of land, $1,200 in buildings, and $33,190 worth of machinery, tools and implements; total live assets, $134,500, being $2,900 in raw materials, $96,400 finished product and stock in process, and $35,200 in cash and accounts. The aggregate wages paid is $73,598, and the average number of hands employed during the year is 125. The aggregate cost of materials used is $109,302, being $108,662 for principal materials, $540 for fuel, and $100 for all other materials. The aggregate miscellaneous expenses are $3,662, of which $540 is for rent, $31 for taxes, $91 for insurance, $2,755 for ordinary repairs of buildings and machinery, and $245 for interest on cash used in the business. The aggregate value of the goods manufactured is placed at $205,684.

Washington, D. C., Dec. 5. CHAS. A. OLDHAM.

PAVING BRICK IN THE GAS BELT.

To the Editor of Paving and Municipal Engineering:

SIR—Dr. Cox, of Elwood, Ind., has discovered a process by which he can make a good, hard paving brick out of the ordinary clay found in his section of the state. He has made some as samples, and I had the opportunity to see one before leaving Elwood. It is surely hard enough and if it will stand the absorption test (which he claims it does), I consider it as good a brick as there is in the market at present. I have handled a great variety of paving brick and am a fair judge of them. The Doctor is very enthusiastic over his discovery and claims he is going to revolutionize street paving in the gas belt as he can make his brick for $8.00 per thousand. He intends to erect a factory in or near Elwood and start to manufacture in the spring. F. W. CERNY.

Columbus, Ohio, Dec. 1, 1892.

RECENT LEGAL DECISIONS.

Effect of Excepting Street from Deed.—Where a contract to convey land in a city specified, two parcels between which was a strip that had been surveyed as a street, but had never been conveyed to the city as a street or otherwise, and the deed given pursuant to the contract described the land as one parcel, and included the strip, but excepted "the street heretofore deeded to the city," the exception excluded the strip from the operation of the deed, since the recital in the excepting clause that the strip was "deeded" to the city was merely descriptive of the strip. *Rushton* v. *Hallett*, Sup. Ct. of Utah, 30 Pac. Rep. 1014.

Right of Drainage.—A land-owner has the right to discharge the surface water of his land, and such as comes naturally thereon, through a drain upon an adjoining owner, but not to increase the discharge to such an extent as to overflow, by changing the course of drains already established and having other outlets. But the existence of a drain many years before, along a certain line, does not give one the right to re-open same, regardless of the consequences to an adjoining owner resulting from the increased flow. *Osten* v. *Jerome*, Sup. Ct. Mich., 53 N. W. Rep. 7.

Not Necessary to Refer to Landmark or Survey.—In an action of ejectment to recover certain real estate, which the petition described by metes and bounds, commencing at the S. E. corner of the N. W. ¼ of the N. ½ of a specified section, town and range, a motion to make the petition more definite and certain by requiring the plaintiff to set forth therein by some definite landmark or survey where said corner is situated, was held properly overruled. *Mills* v. *Traver*, Sup. Ct. Neb., 53 N. W. Rep. 67.

Municipal Liability for Change of Street Grade.—Under a constitu-

tion which declares that "municipal and other corporations. . . . shall make just compensation for property taken, injured or destroyed by the construction or enlargement of their works, highways or improvements," one who has built a house on his lot in conformity with the existing physical grade of an old public highway in front of the lot, may recover from the city damage to the lot resulting from a change in grade. But, where a city changes the grade of the street, it is not liable to the abutting lot-owner for damages resulting therefrom to a house erected on the lot after the change in grade was authorized. *O'Brien & Groff* v. *City of Phila.*, Sup. Ct. Pa., 20 Atl. Rep. 1047.

Expense of Changing Grade of Street.—Where a Connecticut borough charter, conferring power to order owners of land abutting on public streets to construct sidewalks at their own expense, provides that when, in pursuance of such order, an owner builds a sidewalk and it is deemed necessary by the borough to change the same within ten years thereafter, such change must be made at the borough's expense, the statutes of the state also providing that where the abutting owner shall sustain special damage by a change of grade of highway, the borough making the change shall be liable therefor, raising the grade of a street by a borough necessitating laying a new sidewalk in place of a perfect existing sidewalk, which was built more than ten years before at the expense of the owner, the borough is not liable for the cost thereof. And the fact that such change of grade rendered useless an abutting owner's steps which projected into the sidewalk, and which he had used without objection for twenty years as a means of access to his basement, is not an element of special damage; the borough charter conferring "sole and exclusive authority and control over all streets," and he having acquired no right to obstruct any part of the sidewalk with steps. *Shelton* v. *Borough of Birmingham*, Sup. Ct. of Errors of Conn., 24 Atl. Rep. 979.

Variance Between Public Contract and Precedent Advertisement.—Where a board of city trustees adopts a resolution of intention to construct a sewer along a portion of a street, but lets a contract for constructing the sewer along only a part of the portion specified in the resolution, the contract is void, and an assessment under the same creates no lien on property benefited. *McBean* v. *Reddich*, Supr. Ct. Cal., 31 Pac. Rep., 7.

Liability of Company for Unauthorized Acts of Employes.—Where the engineman of a railway company runs his train within the city limits at a rate of speed forbidden by a city ordinance, the company is liable, though it had instructed the engineman not to so run his train, and had no knowledge of his act. *City of Hammond* v. *N. Y. C. & St. L. Ry. Co.* Appel. Ct. Ind., 31 N. E. Rep., 817.

Compensation for Right of Way in Missouri.—In an action against a railway for the appropriation of land for a right of way, the owner is entitled to recover the value of the land taken, and the damages, if any, to the tract of which it forms a part, estimated as of the date of taking possession, less the benefits peculiar to said tracts from the location of the road. *Ragan* v. *K. C. & S. E. R. Co*, Sup. Ct. Mo., 20 S. W. Rep. 234.

Conclusiveness of Engineers' Certificates.—A contract for building a sewer provided that the work should be done under the direction of the city engineer, that the plans to be given by him should be complied with, and that the return of the engineer should be the account by which the amount of the work done and materials furnished should be computed. After the completion of the work under the supervision, and in compliance with the directions of the engineer, he certified that is was satisfactory, and filed a final account showing the amount due the contractor; whereupon the council adopted a resolution declaring its intention to issue bonds to pay for the improvement, and, as assessment was made, and a portion collected, the issuance of the bonds, the payment to the contractor of the money collected, and the collection of the rest of the assessment, would be compelled by mandamus, though the sewer was defective, and did not comply with the contract and specifications in all respects; there being no allegation of fraudulent practice in the procuring and giving of the certificate. *People* v. *City of Syracuse*, Sup. Ct. N. Y., 20 N. Y. Sup. 236.

NEW PATENTS.

MR. V. H. LOCKWOOD, patent attorney and solicitor, No. 60 East Market street, Indianapolis, furnishes us the following list of patents of recent date of interest to our readers. Copies can be procured of him if desired:

Brick Machine. No. 485,323. F. C. Fawcett, Leeds, England.
Brick Press. No. 485,594. J. J. Kulage, St. Louis, Mo.
Concrete Mixing Machine. No. 484,428. E. L. Ransom, Oakland, Cal.
Brick Machine. No. 484,319. George Isaacs, St. Louis, Mo.
Street Cleaning Machine. No. 484,191-92. R. W. Furnas, Indianapolis, Ind. (Two patents.)
Brick and Tile Press. No. 484,896-97. J. J. Kulage, St. Louis, Mo. (Two patents.)
Bridge Gate. No. 484,122. C. Stocker, Jr., Saginaw, Mich.
Bridge Gate. No. 484,470. A. J. Smith, Coal City, Ill.
Portable Bridge. No. 484,086. J. T. Cassidy, Harrison, N. J.
Truss Bridge. No. 484,686. J. H. Stone, Dallas City, Ill.
Artificial Marble. No. 484,565. J. G. Maardt, Copenhagen, Denmark.
Building Block. No. 485,289. A. A. Miller, Canton, Ohio, assignor to H. Bedeman, same place.
Garbage Drier and Burner. No. 484,774. F. Cain, St. Paul, Minn.
Apparatus for Purifying Sewage. No. 484,823. E. E. Scruby, Epping, England.
Electric Arc Lamp. No. 484,199. J. A. Hayes, Carson City, Nev.
Electric Arc Lamp. No. 484,530. Carl Coerper, Coeln, Germany.
Gas Machine. No. 484,134. L. J. Phelps, Passaic, N. J.
Apparatus for Generating Gas. No. 485,009. C. W. Isbell, New York, N. Y.
Electric Arc Lamp. No. 485,537. Edgar Edwards, Cincinnati, Ohio.
Electric Arc Lamp. No. 485,327. E. R Knowles, Middleport, Conn.
Electric Arc Lamp. No. 485,293. J. A. Mosher, Chicago, Ill.
Steam Road Roller. No. 486,481. H. W. Laster, Chicago.
Manufacture of Artificial Stone. L. Enricht, Chicago. Assignor to the U. S. Durolithic Co., West Union, Iowa. Nos. 486,443 to 486,450. Eight patents.
Brick Machine. No. 487,161. R. N. Ross and H. H. Keller, St. Louis. Assignors of one-half to M. S. Bowman, same place.
Artificial Stone Block. No. 486,356. D. P. Sanders, Williamsport, Pa.
Truss Bridge. No. 485,689. J. F. Hardesty, Cambridge, O.
Wire Support on Draw Bridge. No. 485,662. J. B. Scace, Albany, N. Y.
Draw-bridge. No. 486,552. C. A. Zimmerman, St. Paul, Minn.
Draw-bridge Gate. No. 486,793. F. A. Philbrick, Chicago.
Safety Gate for Bridges. No. 486,758. H. J. Rohlf, Chicago.
Draw-bridge Gate. No. 486,843. A. G. Anderson, Chicago.
Electric Arc Lamp. No. 485,895. J. R. Steers, New York City.
Arc Lamp. No. 485,784. Brooklyn, N. Y.
Apparatus for Tapping Water Mains. No. 485,715-16-17. Three patents. A. P. Smith, Newark, N. J.
Syphonic Water Distributing Apparatus. No. 485,953. J. K. Leedy, Tom's Brook, Va.
Water Elevator. No. 486,002. R. W. Tinsley, Union. S. C.
Water Filter. No. 486,859-60. Two patents. J. Davis, San Francisco, Cal.
Garbage Receptacle. No. 486,619. W. T. Rossell & H. F. Haden, Washington, D. C.
Gas Producer. No. 486,497. A. K. Murray, Bradford, Pa.
Pipe Coupling. No. 486,936. J. Lister, Chicago.

PERSONALS.

General Thomas S. Sedgwick has been appointed city engineer of San Diego, California.

Mr. J. J. R. Croes has been investigating the condition of the water-works system of Middleborough, Ky.

Mr. George C. Waterman, of Chicago, has been appointed county surveyor of Cook county, Illinois.

Mr. H. W. Reed, Atlanta, Ga., has been appointed president of the American Roadmasters' Association, and Mr. H. K. Burgwin, Grand Rapids, Mich., has been appointed secretary.

Mr. Tout, city engineer of Guelph, Ont., has resigned. The city council decided to dispense with the services of an engineer, but a public movement is being made for his re-appointment.

Mr. D. A. Poynor has resigned his position as city engineer of Dallas, Texas, to construct a sewerage system at Tyler, Texas. He will reside in Dallas, and continue his private practice throughout the state.

Mr. John A. Cole, of Chicago, is preparing plans and specifications for water-works and sewerage systems at Naperville, Illinois. He has been engaged as consulting engineer to report on plans for the reconstruction of the water-works at Evanston, Ill., Connersville, Ind., and St. Charles, Mo.

Improvement and Contracting News.

PAVING.

Jonesboro, Ind., talks of paving Main street.

The streets of Waxahachie, Tex., are to be paved.

Houston, Tex., is laying her first brick pavement.

Main street, Keokuk, Ia., will be paved next year.

Trenton, Mo., is agitating the question of paved streets.

Vitrified brick paving is to be used in Redlands, Cal.

Some of the principal streets of Yoakum, Tex., are being graded.

Prairie street, Galesburg, Ill., will probably be paved next year.

There is much complaint in Chicago about defective sidewalks.

Bangor, Me., wants 80,000 granite paving blocks for next year's work.

Goshen, Ind., will pave several of its principal streets with brick.

Rock Island, Ill., is making movements for more paving in the spring.

The streets of Ottawa, Ill., are being paved and otherwise improved.

Columbia avenue, Cincinnati, is to be bowldered at a cost of $15,463.

Ninth street, East St. Louis, Ill., is being graded, drained and paved.

Portland, Ore., has expended $750,000 in street improvements this year.

Several miles of street pavement will be laid in Ashtabula, O., next year.

Benton Harbor, Mich., street-paving will probably be postponed till spring.

At least two miles of brick paving will be done in Erie, Pa., next summer.

Oakland, Cal., has her streets in good condition for the coming wet season.

Bicyclists are discussing an asphalt highway between New York and Chicago.

Reading, Pa., is considering a loan of $600,000 to pave twenty miles of streets.

Benton Harbor, Mich., will do $20,000 worth of cedar block paving on its streets.

Fort Howard, Wis., has voted to issue bonds for $15,000 for public improvements.

The little town of Tuscola, Ill, is passing ordinances for the paving of her main streets.

Bids are being received for paving Blake street, Denver, Col. Estimated cost, $50,429.

Garner avenue, from Walrond to Independence avenues, Kansas City, Mo., will be paved.

Geo. Kriechbaum has completed a contract for six blocks of brick paving in Keokuk, Ia.

Dubuque, Ia., is well pleased with her new brick pavements, and wants more in the spring.

The Duluth board of public works has awarded grading contracts to Newton & Morrison and J. D. O'Connell.

The city of Evansville, Ind., will pave seven miles of street with brick the coming year.

An addition of twenty-six feet will be made to the width of Fayette street, Baltimore, Md.

The streets of LaCrosse, Wis., have never been in better condition for winter than they now are.

The square around the court house in Wilkesbarre, Pa., will be paved and otherwise improved.

Over $800,000 have been expended this year for grading, paving and sewer work in Superior, Wis.

Pacific avenue, Atlantic City, N. J., will be rebuilt with gravel at a cost of several thousand dollars.

The estimated cost for the improvement of Elsinore avenue, Cincinnati, with granite, is $21,000.

A levy of $27,000 is to be made on property in Pekin, Ill., for the purpose of laying street pavements.

About three hundred employes are now engaged in the street and sewer department of Lowell, Mass.

Parts of Western and Nebraska avenues and Wisconsin and Dorr streets, Toledo, Ohio, are to be paved.

Dallas, Tex., is having some substantial street work done, greatly improving the appearance of the city.

Barnesville, O., has laid, during the past year, over 19,000,000 square yards of street paving at a cost of $21,000.

Contractor James Malone is to do the brick paving on Third, Adams and Washington streets, Troy, N. Y.

Winona, Minn., will let contract in January for paving three miles of her business streets with vitrified brick.

The city engineer of Santa Barbara, Cal., has prepared estimates for sidewalks and paving to cost about $22,000.

Asphalt will be laid on the Circle and contiguous streets in Indianapolis in the spring. The estimated cost is $40,000.

East Fifth street, Portland, Ore., will probably be paved with Trinidad asphalt. Milwaukee street will also be improved.

The proposed paving of lower Water street, Halifax, N. S., with wooden blocks will cost in the neighborhood of $50,000.

Dayton, Ohio, is having some trouble with her new brick pavement owing to the fact that it was laid on a cushion of wet sand.

Twelfth street, Kansas City, is to be paved; a choice will be made by the property owners between granite blocks, brick and asphalt.

Resolutions have been adopted by the Cleveland, O., city council for the improvement of Center, Elm, Harper and Gallup streets, Hodge and Scranton avenues and Dexter place.

Chicago is agitating the subject of compelling the use of broad-tired wagons on her streets in order to lessen the wear of pavements, and the valuable reform is likely to be adopted.

Butte City, Mont., having about completed her sewer system, will turn her energies towards the improvement of streets in the spring.

Hawthorne avenue, Portland, Ore., will soon be one of the finest drives in the city. About $25,000 are to be expended on the Albina race-track.

The Hazleton, Pa., city council has decided to improve the square around the court-house yard, by the laying of a granolithic pavement.

Eighteenth street to the northern city limits and the Boulevard from Woodward avenue to Grand River avenue, Detroit, Mich., will be paved.

The contract for 10,800 square yards of brick street paving in Chattanooga, Tenn., has been let to the Southern Construction Company, of that city.

Bids have been allowed to Fleetford & O'Neill for final estimates on sewer work in Denver, Colo., amounting to $2,230, and to Murphy & Nelles for $5,521.

The bids for paving South Kickapoo street, Lincoln, Ill., were not accepted, and the prospect is that the much-needed work will be postponed until next summer.

Contracts have been awarded for the grading of parts of Maple, Thirty-second, Thirty-third and Twenty-fourth streets, Omaha, Neb. Portions of Fifth, Vine, Ninth, Twenty-sixth, Brooklyn, Terrace and Guinotte streets are also to be improved.

Robt. J. Boyd has the contract for paving St. Louis avenue, from Santa Fe street to Union avenue, Kansas City, Mo., with diamond vitrified brick, for $10,064. The contract for brick paving on Woodland avenue, between Twelfth and Fifteenth streets, has been let to James O'Donnell at $8,526.

The movement now being made to establish in Washington a road department for the purpose of promoting knowledge in the art of constructing and maintaining roads, and for a permanent exhibit in which various methods of construction may be shown, is being heartily indorsed in all sections of the country.

The highway committee of Philadelphia councilmen has recommended appropriations for next year, aggregating over $1,600,000, $300,000 of which is to be used for repaving streets, and $300,000 for completing the asphalt pavement on Broad street. The estimated cost of the proposed boulevard from the city hall to the park, is $6,000,000.

SEWERS.

Boulder, Colo., wants a good sewer system.

Waterloo, Ia., is to construct a sewer system.

Modesto, Cal., will have a $25,000 sewer system.

Humbolt Parkway, Buffalo, N. Y., is to have a new sewer.

Kingston, N. Y., is in great need of a good sewer system.

A sewer has been commenced in St. Joseph avenue, Niles, Mich.

Texarkana, Ark., is improving her sewer system.

Bloomfield, N. J., is having a $38,000 sewer made.

Fort Scott, Kan., is agitated over sewer improvements.

Fremont, Neb., is having paving and sewer work done.

A number of new sewers are to be constructed in Troy, N. Y.

An extension will be made to the sewer system of Seattle, Wash.

Oberlin, O., is making a move to obtain a complete sewer system.

A new sewer will probably be laid in Ann street, Middletown, Pa.

A $160,000 system of sewers will be constructed at Weston Springs, Ill.

The contract has been let for a $32,000 sewer system in Negaunee, Mich.

Lorin, a suburb of Oakland, Cal., is greatly in need of a sewerage system.

Open sewers on Webster avenue, New York, are causing a great deal of sickness.

A main sewer is proposed in Bay street, Jacksonville, Fla. Estimated cost $40,000.

A commendable effort is being made in Portersville, Cal., to give the town proper sewerage.

Work is being pushed on the B street and Mendocino street sewers in Santa Rosa, Cal.

The subject of a perfect drainage and sewage for Geneva, N. Y., is now taking active form.

Parts of Hapsburg street and Durell avenue, Cincinnati, are to have sewerage improvements.

F. E. Cole, of Toledo, O., has the contract for a large sewer in the Tenth ward, Fort Wayne, Ind.

An appropriation of $8,000 has been made for a sewer in Meadow street, Wallingford, Conn.

The citizens of Keokuk, Ia., are congratulating themselves on their excellent sewer system.

Newark, N. J., is discussing the subject of providing sewerage for the Woodside section of the city.

The city treasurer of Newton, Mass., has been authorized to borrow $119,000 for sewer construction.

The common council of Jameston, N. Y., has materially extended the recently proposed sewer system.

Eight thousand, eight hundred and four feet of sewer mains have been laid this year in Monmouth, Ill.

Des Moines, Iowa, is proud of the mammoth sewer which has been put down on Seventh and Elm streets.

Fred Kleinman was the lowest bidder for the construction of main sewer No. 4, on North Main street, Findlay, O.

A great deal of sewer work is being done in Portland, Ore. There is a constant demand for more sewers all over the city.

As a preliminary to the adoption of a uniform system of drainage for the city of New Orleans, La., the question of a complete topographical survey of the city is being discussed.

Moline, Ill., is to construct a sewer on Sixth avenue from Twenty-sixth to Twenty-third streets, thence north to Fifth avenue.

Henry Byrne has been awarded the contract for the construction of the proposed Ocean avenue sewers, Jersey City, N. J.

The Le Mars, Iowa, council desires to put in a sanitary sewerage system, on which it is expected to begin work in the spring.

The Detroit, Mich., board of health has awarded contracts for sewers to Ferd Porath, Lephardt & Winterhalter, and Thos. J. Whittaker.

Five miles of sewers have been added to the sewer system of Bay City, Mich., during the last year and a half at the low figure of $23,000.

The board of works of Halifax, N. S., has voted to petition the legislature for authority to spend $200,000 in the next two years for building sewers.

Over 4,000 feet of iron and brick sewer have been laid this season in Battle Creek, Mich. Further sewer construction has been postponed until spring.

Sanitary sewers are to be constructed in Michigan street, from Second avenue east to Third avenue east, and through block 23, third division, Duluth, Minn.

F. D. Mayr has been awarded the contract for sewers in Bromfield street, Cypress avenue, Estes street, Southworth court and Burrill street, Lynn, Mass.

The Spokane, Wash., board of public works has passed a resolution recommending that an eight-inch sewer be laid on Washington street north from Front avenue.

An appropriation of $30,000 has been made for the O. K. creek sewer, Kansas City. Eight thousand dollars will probably be expended for a sewer in the packing house district.

Woodland, Cal., is having a substantial improvement boom. A $20,000 sewer system has just been completed and work has been begun on a $35,000 extension to the water-works system.

New Bedford, Mass., has a steam drill at work on a trench excavating to lay a 12-inch sewer pipe in Belleville avenue, north of Coggeshall street. There is nearly six feet in depth of solid ledge.

Butte City, Mont., has almost completed her new sewer system. It is all that could be desired. About $300,000 have been expended in building storm culverts, putting in sanitary sewers, and grading streets.

Aurora, Ill., has a system of sewers almost completed on the west side of the city measuring eleven miles in length. The east side, where there are twenty-three miles to be put in, will come next.

The drainage commission of Middletown, Pa., is having a report and estimate of the St. Catherine street sewer district made by Alexander Potter, of Olean, N. Y. The trunk sewer will be a four foot brick drain a mile long.

Bids are being received for the construction of a brick sewer main and wooden outfall on English street from Lake Michigan to North Erie street, and main brick sewer on Sixteenth street from Lake Michigan to Junction avenue, with sewer outfall at the lake, Racine, Wis.

Berwick, Pa., is to have a sewer system consisting of about ten miles of pipe sewer and flush tanks, to empty into the Susquehanna river. Alexander Potter, of Olean, N. Y., has been employed by the council to make surveys, plans and profiles for sewerage purposes, and to establish grades throughout the borough.

Philadelphia, Pa., proposes to spend in 1893 nearly $2,000,000 for sewers. The estimates handed in by the department of public works include $1,000,000 for main sewers, $250,000 for the Aramingo canal sewerage system, $350,000 for branch sewers and $110,000 for intercepting sewers. The estimates also call for $150,000 for a new bridge over the Schuylkill and $500,000 for subways on Market street from the Delaware river to the City Hall. All of these items are formally indorsed by the survey committee of councils.

WATER-WORKS.

Bucyrus, O., wants water-works.

Linwood, O., is to have water-works.

Columbia, Mo., is to have water-works.

Fairhaven, Mass., is to have water-works.

South Bethlehem, Pa., wants purer water.

Freeland, Mich., is soon to have water-works.

Anderson, Ky., has voted for water-works.

Oakesdale, Wash., is to have water-works.

Danville, Ky., is planning a water-works system.

Cadillac, Mich., has a new water-works system.

Madison, Wis., water-works are being enlarged.

Water-works are talked of at Deckertown, N. J.

Shenandoah, Pa., has decided to build water-works.

Los Cerrillos, N. M., has contracted for water-works.

A new water-works system is wanted in Mahoney, Pa.

Wallingford, Conn., will have additional water supply.

Hamilton, O., will extend its water-works system.

The water-works of Nashville, Mich., have been enlarged.

Sandusky, O., is making a move for a better supply of water.

Charlevoix, Mich., is well pleased with its water-works system.

Work has been begun on the town water-works of Ontario, Cal.

Williamsburgh and Dublin, Tex., have new water-works systems.

A vote on the water-works question will be taken in Howell, Mich.

A $60,000 water-works system will be established at Modesto, Cal.

The Cedar Rapids water-works company will purchase a $65,000 filter.

The capacity of the Cincinnati water-works plant is to be increased.

The city water-works of Kalamazoo, Mich., will have a ten ton boiler.

Bradford, Vt., will appropriate $5,000 to complete its water-works system.

Burlington, Ia., wants a $60,000 filter in connection with her water-works.

Oakley, Kan., needs water-works and is making a move in that direction.

Buchanan, Mich., is taking steps towards getting a water-works system.

Des Moines, Ia., is considering methods of obtaining a better water supply.

Bentonville and Jonesboro, Ark., are agitating the water-works question.

The capacity of the new water-works pump at Monmouth, Ore., is 10,000 gallons.

Martinsville, Ind., is to have water-works. The council is looking for a good plan.

The city of Independence, Mo., will probably purchase the water plant used there.

The Niobrara, Neb., town board has advertised for bids for a system of water-works.

Berlin, Wis., will vote on the question of water-works at the city election next spring.

The water-works question is again agitating the minds of the people of Belleville, Mo.

A vote on establishing water-works will be taken at Meredith, N. H., and Barnesville, Ga.

The estimated cost of the new storage system reservoir at South Norwalk, Conn. is $131,000.

Fairbury, Ill., is putting in a system of water-works. Bonds to the amount of $15,000 were issued.

Twelve thousand dollars will be expended in improving the water-works plant at Martin's Ferry, O.

The proposed water system in Eastern Delaware county, Pa., will cost in the neighborhood of $400,000.

A company will probably be formed in Kendrick, Wash., for the purpose of putting in a water-works plant.

The Doylestown, Pa., council has given authority to the water committee to procure a better and purer supply of water.

Fifty thousand dollars' worth of bonds will be issued for the purpose of establishing a water-works system in Norwood, O.

R. H. Rogers, of Plattsburgh, N. Y., has the contract for the new water-works at Saranac Lake. The work will cost $32,000.

St. Louis owns her own water-works and is using whatever surplus arises from the revenues in the extension of the system.

Ithaca, Mich., is to expend $22,000 in a water-works plant. A combination of stand-pipe and direct pressure will be used.

The Atlantic City, N. J., council has at last decided to purchase the water-works of that place, the price to be paid being $500,000.

The city of Newark, N. J., is about to build a storage reservoir outside the city limits at a cost of several hundred thousand dollars.

The work on the reservoir for the new water-works at North Vernon, Ind., has commenced and by July 1, 1893, the works will be in operation.

The contracts for putting in the system of water-works at Mayville, N. Y., has been let to Chandler Brothers, of Beaver Falls, Pa., for the sum of $16,750.

The water-works system at Waitsburg, Wash., is being constructed as rapidly as possible. The reservoir is being blasted out of the solid rock of a hill north of the city.

The city of Galesburg, Ill., has just found out that her water-works plant is a splendid paying investment. The net gain last year over all operating expenses was over $4,000.

Neely & Smith, of Chattanooga, Tenn., have been awarded the contract to erect the Athens, Ga., water-works. The Chattanooga Pipe Works will cast the 2,000 tons of pipe needed.

Deming, New Mexico, is to be provided with an excellent system of water-works, and also furnished with sufficient water for the irrigation of 1,500 acres of land east and south of the town.

The largest reservoir in the world is now being built near Phœnix, Ari. It will be a lake eight miles long, half a mile wide and twenty-five feet deep. It will hold water from the winter rains.

The city council of Rockford, Ill., has voted to build a concrete reservoir to cost $18,000. By this means they will have a reserve water supply, available in case of fire without pumping the impure river water into the mains.

Newport and Covington, Ky., will construct a ten-inch main over the Fourth street bridge, thereby connecting the two systems of water-works, the line to be used in case a break should occur in the main line from either city.

The contract has been closed for the construction of the two great basins for the new water-works plant in Rome, Ga. The basins will be located on the top of Fort Jackson Hill, and will afford sufficient pressure to throw water fifty feet above the highest building in Rome.

A water company recently organized at Pocatello, Idaho, is putting in a system of water-works that will surpass anything of the kind in the state. At an elevation of 560 feet above the city a reservoir has been made with a storage capacity of 3,000,000 gallons. This reservoir is connected with a lower reservoir at an elevation of 250 feet, capable of holding the same amount. Six miles of cast iron pipe have been laid, and the whole system will be in use in a short time. The water in these reservoirs comes from mountain streams and is absolutely pure.

BRIDGES.

DeKalb county, Mo., will build nine new bridges.

A new bridge will be built over the river at the end of Kentucky avenue, Indianapolis.

The Wrought Iron Bridge Company, Canton, O., will manufacture about 800 bridges this year.

The stone abutments for the Wabash bridge over the Monon at Westville, Ind., cost $22,000 each.

The citizens of the town of Burlington, Wis., want a new $8,000 bridge erected across Fox river.

The county commissioners are putting up a number of badly needed bridges in and near Clyde, O.

Over 1,000 hands are employed in building the "Katy" bridge over the Missouri river above Baden, Mo.

The commissioners of Weatherford, Tex., are considering the building of a bridge across the Brazos river.

A wagon and street-car bridge over the Missouri at Jefferson City, Mo., is talked of. It would cost $100,000.

A new bridge is to be built across the Middle Loup river, west of Loup City, Neb. The contract has been let.

The board of supervisors of Butler county, Ia., has authorized the auditor to advertise for bids for bridge work in 1893.

The Pittsburgh Bridge Co. has been awarded the contract for building Halstead street bridge, Chicago. The cost will be $177,000.

Prophetstown, Ill., will soon have a bridge over Rock River. The contract has been let to the Milwaukee Bridge Company for $26,000.

Park street bridge, Columbus, O., has been declared unsafe. A bridge is wanted in that city over the canal and river at the foot of Schiller street.

One of the most beautiful structures of its kind in the world is the Washington bridge across the Harlem river at 181st street, New York. It cost $2,700,000.

A steel bridge 315 feet long, consisting of a single span, is to span the Missouri Pacific tracks immediately north of the Fourth street viaduct, Kansas City, Mo.

The Yankton Bridge Company has the contract for building a combined railroad and wagon bridge over the Missouri river at Yankton, S. Dak. Work will be commenced before the first of July, 1893.

The contract for the superstructure of the new steel bridge over the Missouri at Leavenworth, Kan., has been let to the Union Bridge Company of New York, and the approaches to the Missouri Valley Bridge Company of Leavenworth.

The building of the great new draw-bridge at East Omaha, Neb., with the heaviest and largest draw in the world, is attracting the attention of engineers and railroad men throughout the country. The draw will be 520 feet long, resting on a pivot thirty feet wide, which will rest on a pier forty feet wide and ninety feet high above the water. Upon this comparatively small pivot, over 3,500,000 pounds of iron and steel will rest and balance to the nicety of a hair, so that the movement of a button operating the electric apparatus which will work the draw, will swing it out. This bridge will also have the longest fixed span in the world, 560 feet.

STREET LIGHTING.

Danvers, Mass., will be lighted by electricity.

Columbia, Mo., is to be lighted with electricity.

Tucson, Ariz., will soon be lighted by electricity.

An electric light plant will be erected at Oxford, Md.

Anderson, Ind., will invest $35,000 in an electric light plant.

An electric light and power company has been formed in Durand, Wis.

Bids will be asked for thirty days for lighting the streets of Detroit, Mich.

Hillsdale, Mich., has voted to issue bonds for $15,000 to erect and maintain an electric light plant.

Thompsonville, Conn., has voted to provide for forty arc lights for street lighting at $90 each per year.

The citizens of Monroe, N. C., have voted to issue bonds for $15,000 for the equipment of an electric light plant.

The citizens of Bardstown, Ky., are discussing the expediency of constructing an electric plant for street lighting.

The council of South Brooklyn, Ohio, is figuring on an electric plant which will probably be erected in the near future.

PUBLIC PARKS.

The Park system of Omaha, Neb., now embraces several hundred acres, and is valued at nearly $2,000,000.

At an expense of $16,000, Mr. and Mrs. G. P. Lord, of Elgin, Ill., have made that city a present of Oakwood Park for park purposes, provided no liquor shall be sold in the park.

The park purchasing committee, appointed some time ago in Denver, Col., has been investigating the subject lately. Several large tracts of land will probably be purchased for park purposes and improved with fine streets.

The commission appointed to take charge of the construction of that portion of the Chickamauga National Park lying in Tennessee, have secured land from the boulevard and tower at Sherman Heights, the north end of Mission Ridge, and half the land necessary at Orchard Knob in the valley.

There is a scheme on foot in Minneapolis to turn Sandy Lake and some of the land lying north and east of it to Central avenue, into a park with handsome driveways. The Northeast Improvement Company has offered to give $25,000 towards putting the park in shape, provided the park board thinks it advisable to make another park.

CHRISTMAS DINNER.

But a Christmas dinner without good cooking is a hollow mockery. The Cincinnati, Hamilton & Dayton Railroad Company, whose dining-car service between Indianapolis and Cincinnati is famous for good cooking, have issued a special edition of the Martha Washington cook-book, 320 pages, fully illustrated, which will be sent post-paid to any address on receipt of ten cents in stamps. This cook-book is the best in the market. The C., H. & D. is also the best road between Indianapolis and Cincinnati, with five trains a day each way, and chair cars on four of them. Send ten cents to E. O. McCormack, G. P. & T. Agt., Cincinnati, Ohio, and get a cook-book free.

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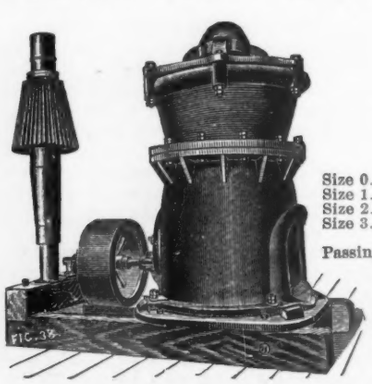

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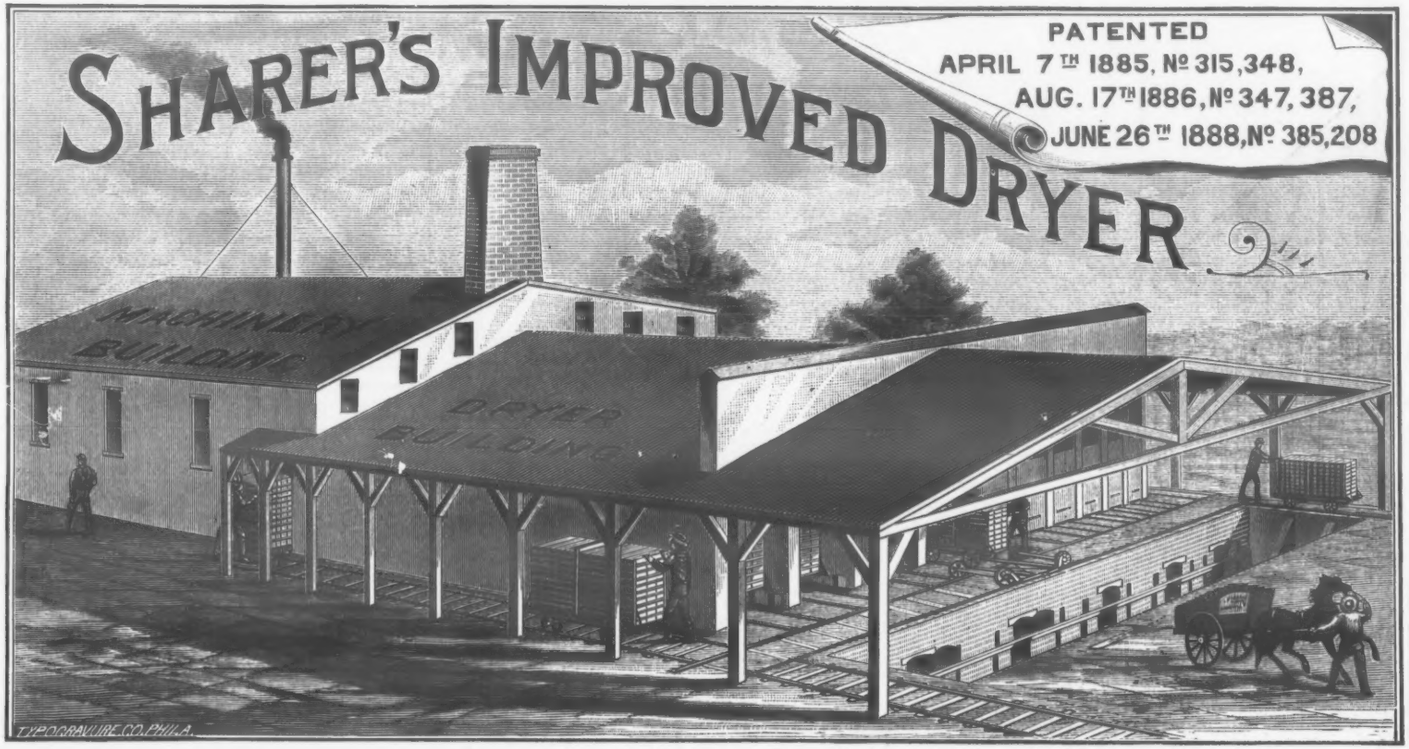

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This curb is continuous throughout its entire length, and has no joints to separate and get out of position, as the short lengths now used of the ordinary stone invariably do, after a few years of use.

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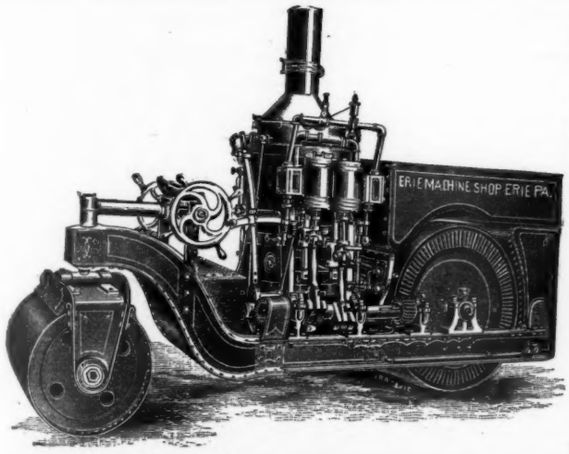

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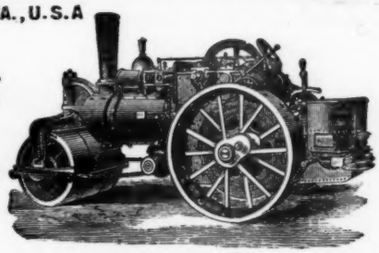

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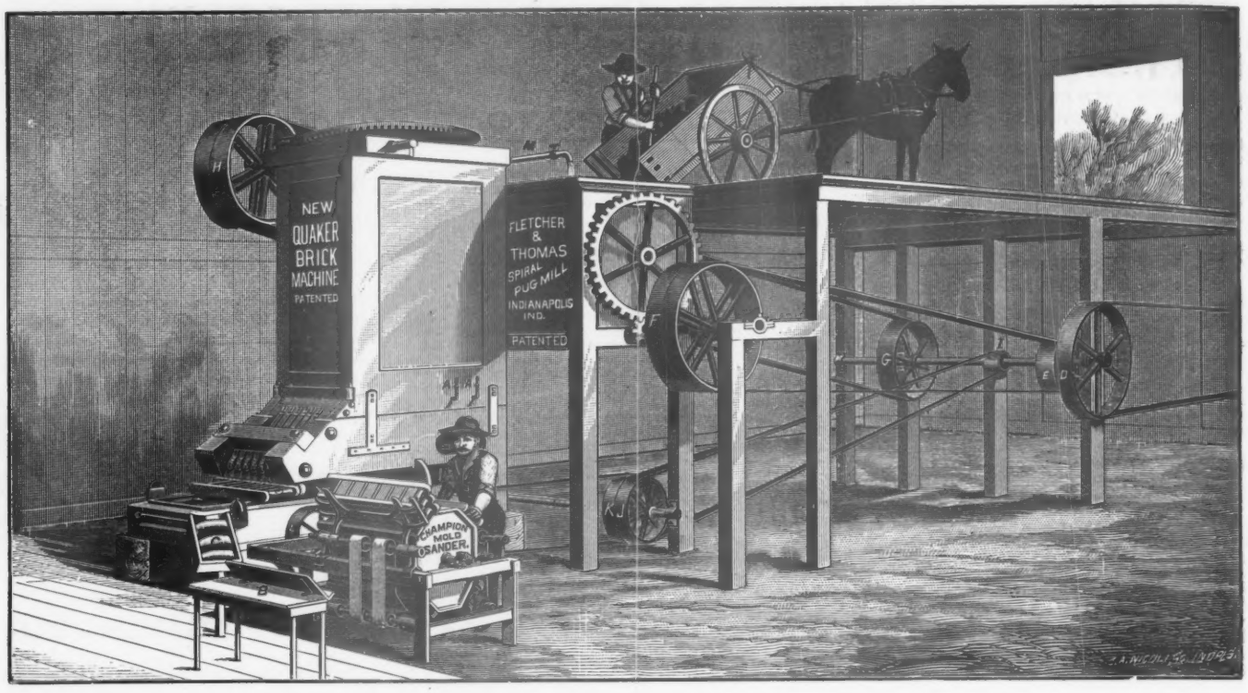

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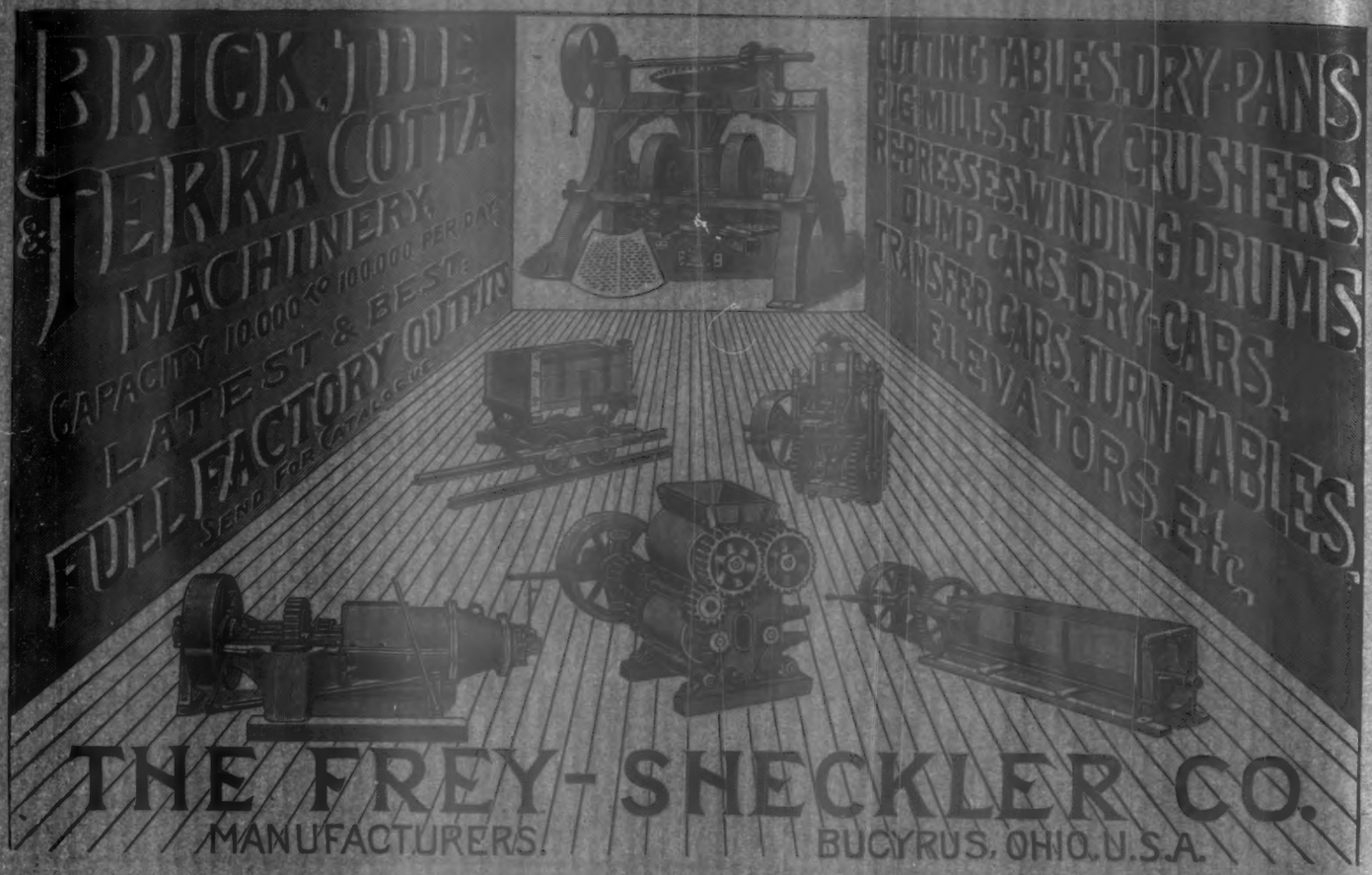
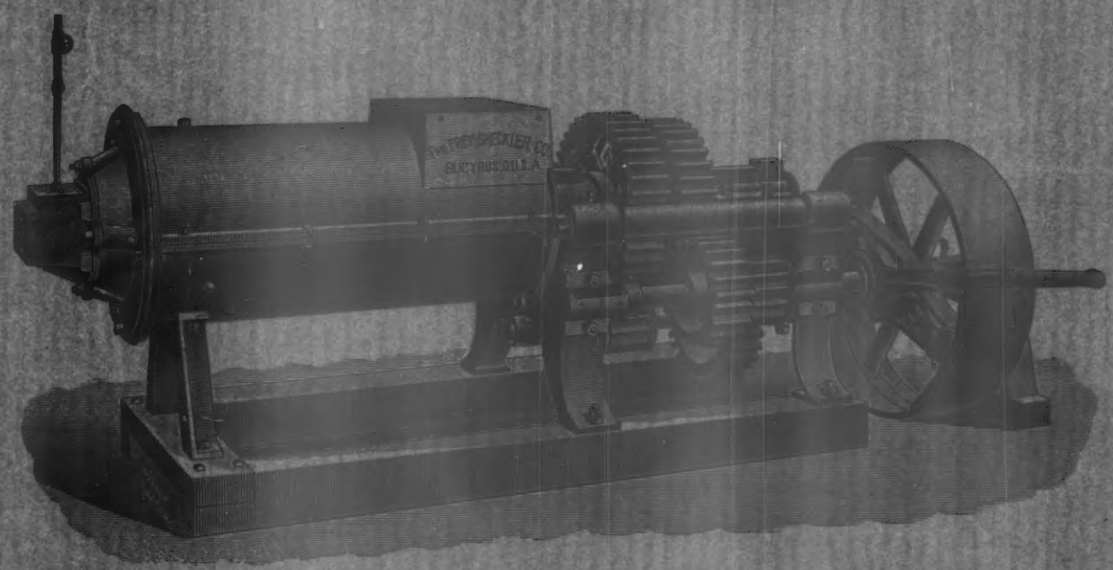
W. B. LOWER, Secretary.

NOTE.—Mr. Lower had an experience with another make of brick machine before he put in the "Chambers."

For Advertisement of Chambers' Machinery, see last cover page.





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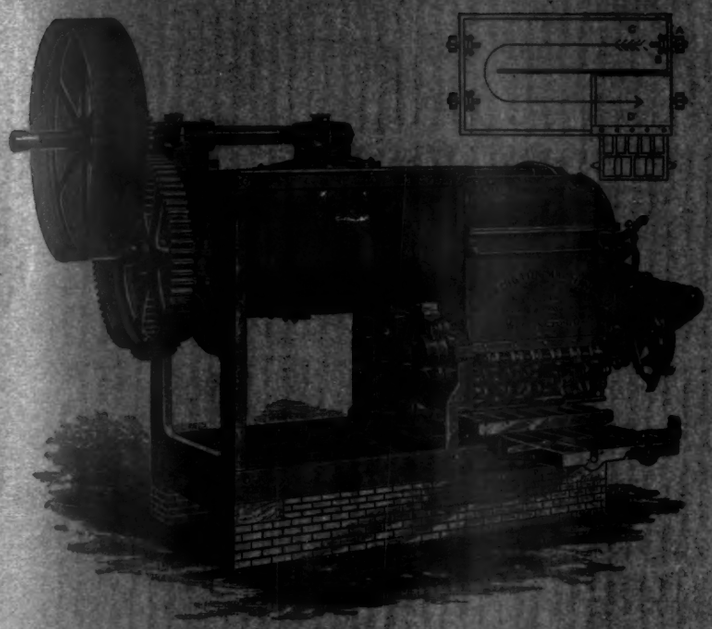

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It has the greatest tempering capacity (14 feet of pug-mill).

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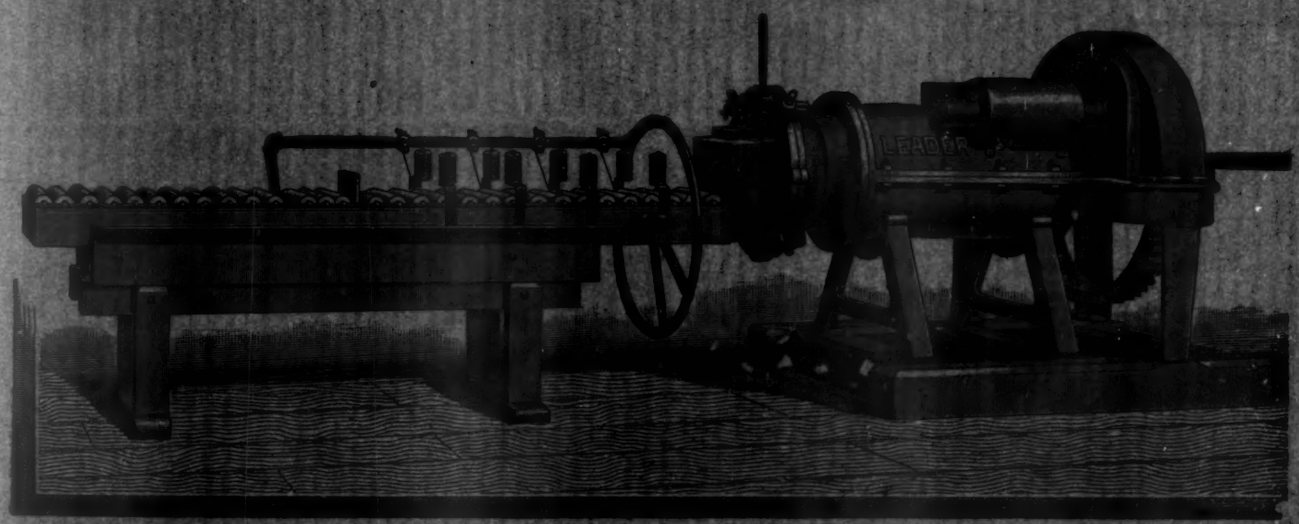

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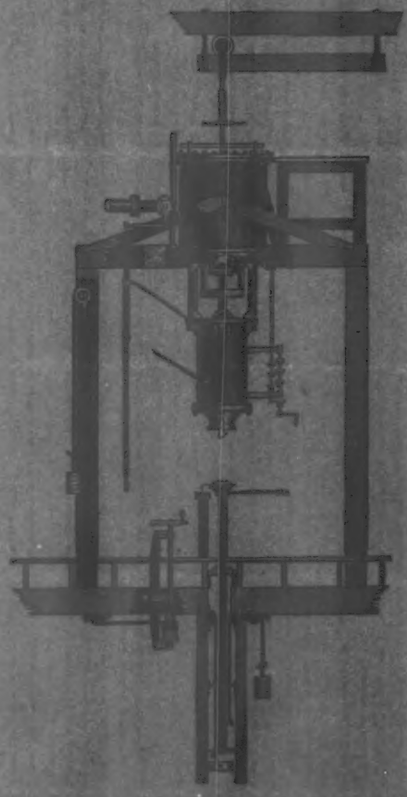

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